

Please help me translate this text into English: "Global, Local, Shallow, and Deep Nature of the Evolution of Natural Universe Structure" 2025 v1.1

Global, Local, Shallow, and Deep Nature of the Evolution of Natural Universe Structure 2025 v1.1

The motion and change of celestial bodies and particles in the universe involve the characteristics of ultra-spin in some theories and research. The ultra-spin characteristics of celestial bodies:- Ultra-spin usually refers to the rotation of celestial bodies at extremely high angular velocities. For stars, rapid rotation significantly alters their shape, transforming them from a perfect sphere to an oblate spheroid. For example, the equatorial region of a rapidly rotating star will bulge outward due to the centrifugal force.- Some compact celestial bodies, such as pulsars, exhibit more pronounced ultra-spin characteristics. Pulsars are rapidly rotating neutron stars that can rotate dozens or even hundreds of times per second. This ultra-high-speed rotation is caused by the conservation of angular momentum during the stellar collapse process. The original large radius of the star is greatly reduced when it collapses into a neutron star. According to the angular momentum formula $L = I\omega$ (where L is the angular momentum, I is the moment of inertia, and ω is the angular velocity), the reduction in the moment of inertia leads to a sharp increase in the angular velocity.

Impact on the surrounding environment:- Ultra-spinning celestial bodies generate strong gravitational and magnetic fields. Taking pulsars as an example, the ultra-spin of pulsars creates an extremely strong magnetic field, forming a magnetosphere. In the magnetosphere, charged particles are accelerated to extremely high energies, moving along magnetic field lines and producing radiation beams. When these radiation beams sweep across the Earth, we observe periodic pulsar signals.- Ultra-spin can also cause the distortion of spacetime. According to Einstein's general theory of relativity, rotating massive celestial bodies can cause the surrounding spacetime to be dragged, a phenomenon known as frame-dragging. For example, the rotation of the Earth also causes a slight distortion of the surrounding spacetime, but for ultra-spinning compact celestial bodies, this effect is much more significant.

Ultra-spin characteristics of particles:- Quantum spin concept:- In quantum mechanics, particles possess an intrinsic angular momentum known as spin. Spin is one of the fundamental properties of particles and is closely related to their angular momentum, magnetic moment, and other properties. Although spin cannot be simply understood as the rotation of an object in the classical sense, it exhibits many characteristics similar to rotation in various aspects.- The spin of particles is quantized. Its values can only be integer or half-integer multiples of $\hbar$ (where $\hbar$ is the reduced Planck constant). For example, the spin of an electron is $\frac{1}{2}$, and the spin of a photon is 1.- Ultra-spin correlation in supersymmetry theory:- Supersymmetry theory is a theory that attempts to unify fundamental particles and interactions. It predicts that every known fundamental particle has a corresponding supersymmetric partner particle. In supersymmetry theory, the spin of a particle differs from that of its supersymmetric partner by $\frac{1}{2}$. For example, fermions (particles with half-integer spin, such as electrons and quarks) have supersymmetric partners that are bosons (particles with integer spin), and bosons have supersymmetric partners that are fermions.-

This spin difference in the supersymmetric relationship reflects a deeper "ultra-spin" correlation. It provides a new perspective for understanding the nature and interactions of particles. If supersymmetry theory holds true, then it may be possible to discover these supersymmetric partner particles in high-energy physics experiments, thereby verifying the existence of ultra-spin characteristics at the particle level.

The role of ultra-spin characteristics in the evolution of the universe:-

- Stellar formation and evolution:-** In the early stages of stellar formation, the rotation of matter can affect the formation process of stars. Ultra-spin may lead to the formation of an accretion disk around the star, with matter in the accretion disk gradually gathering towards the center of the star, promoting the growth of the star.
- In the later stages of stellar evolution,** ultra-spin can influence the way a star explodes and its ultimate fate. For example, a massive star with ultra-spin may produce a more intense gamma-ray burst when it collapses to form a black hole, which is one of the most violent celestial explosion phenomena in the universe.
- Galaxy structure and dynamics:-** Stars and gas in galaxies also exhibit rotational motion. The ultra-spin characteristics of galaxies can affect their shape and structure. For example, the spiral arm structure of spiral galaxies may be related to the rotation of the galaxy and the distribution of matter.
- The ultra-spin of the supermassive black hole at the center of a galaxy** can influence the dynamics of the entire galaxy. The rotation of the black hole can cause surrounding matter to form an accretion disk and produce powerful jets. These jets can extend to distances of tens of thousands of light-years or even farther, affecting the distribution and evolution of matter within the galaxy.

"Ultra-spin of celestial bodies" is not a standard term in the field of astronomy, but we can explore its role in the evolution of the universe from the perspective of the high-speed rotation of celestial bodies (close to the theoretical maximum rotation speed):-

- Impact on the structure and shape of celestial bodies themselves:-**
 - Shape change:** High-speed rotating celestial bodies change shape due to centrifugal force. Taking stars as an example, rapid rotation causes stars to bulge at the equator, becoming oblate spheroids. This change in shape affects the distribution and movement of matter inside the star, thereby influencing the evolutionary process of the star. For example, in the early stages of star formation, rapid rotation may lead to a greater tendency for matter to gather in the equatorial plane, affecting the structure and accretion rate of the stellar accretion disk.
 - Internal structural stratification:** Ultra-spin can cause complex movements and convection patterns of matter inside celestial bodies. In the interior of planets, high-speed rotation makes the stratification of matter more pronounced. Matter of different densities is distributed in different layers under the combined action of centrifugal force and gravity. This layered structure affects the heat conduction and energy transfer inside the planet, having an important impact on the planet's geological activity and magnetic field.
 - Impact on the surrounding environment:-**
 - Ejection of matter and formation of accretion disks:** When stars or planets ultra-spin, matter on their surface may be ejected due to centrifugal force exceeding gravitational binding. The ejected matter forms an accretion disk around the celestial body. Accretion disks are important structures in the formation of planets, material exchange in binary star systems, and the evolution of galaxies. For example, in some young stellar

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arXiv:2405.11505 [gr-qc] 5 pages, 1 figure, 1 table, 1 appendix, 1 bibliography, 1 references
 ##### ## 1. **Hyper-Spinning Black Holes in
 Modified Gravity Theories** A. De Felice, S. Tsujikawa **f(R) gravity
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Translate the Following Content into English (Only Output the Translation Result)Please help me translate this text into English: "Global, Local, Shallow, and Deep Nature of the Evolution of Natural Universe Structure" 2025 v1.1● In

some theories and studies, the motion and variation of celestial bodies and particles in the universe involve hyper-spin characteristics. The hyper-spin characteristics of celestial bodies

- **Hyper-spin generally refers to the rotation of celestial bodies at an extremely high angular velocity.** For stars, rapid rotation will significantly change their shape, transforming them from a perfect sphere into an oblate spheroid. For example, the equatorial part of a rapidly rotating star will bulge outward due to the centrifugal force.
- **Some compact celestial bodies, such as pulsars, have more obvious hyper-spin characteristics.** Pulsars are rapidly rotating neutron stars that can rotate dozens or even hundreds of times per second. This ultra-high-speed rotation is caused by the conservation of angular momentum during the star's collapse. The original large radius of the star is greatly reduced after it collapses into a neutron star. According to the angular momentum formula $L = I\omega$ (where L is angular momentum, I is moment of inertia, and ω is angular velocity), the moment of inertia decreases, and the angular velocity increases sharply.
- **The Impact on the Surrounding Environment**
 - **Hyper-spinning celestial bodies generate strong gravitational fields and magnetic fields.** Taking pulsars as an example, the ultra-strong magnetic field generated by their hyper-spin forms a magnetosphere. In the magnetosphere, charged particles are accelerated to extremely high energies, move along magnetic field lines, and generate radiation beams. When the radiation beam sweeps across the Earth, we can observe periodic pulse signals.
 - **Hyper-spin can also cause the distortion of spacetime.** According to Einstein's General Relativity, a rotating massive celestial body will cause the dragging of the surrounding spacetime, a phenomenon known as frame-dragging. For example, the rotation of the Earth also causes a slight distortion of the surrounding spacetime, but this effect is more significant for hyper-spinning compact celestial bodies.

Hyper-spin Characteristics of Particles

- **The Concept of Quantum Spin**
 - **In quantum mechanics, particles have an intrinsic angular momentum called spin.** Spin is one of the basic properties of particles, and it is closely related to the particle's angular momentum, magnetic moment and other properties. Although spin cannot be simply understood as the rotation of an object in the classical sense, it shows rotation-like characteristics in many aspects.
 - **The spin of particles has the characteristic of quantization, and its value can only be an integer multiple or half-integer multiple of $\hbar/2$ ($\hbar$ is the reduced Planck constant).** For example, the spin of an electron is $1/2$, and the spin of a photon is 1 .
- **Hyper-spin Correlation in Supersymmetry Theory**
 - **Supersymmetry theory is a theory that attempts to unify elementary particles and interactions.** It predicts that each known elementary particle has a corresponding supersymmetric partner particle. In supersymmetry theory, the spin of a particle differs by $1/2$ from the spin of its supersymmetric partner particle. For example, the supersymmetric partner of a fermion (a particle with half-integer spin, such as an electron or a quark) is a boson (a particle with integer spin), and the supersymmetric partner of a boson is a fermion.
 - **The spin difference in this supersymmetric relationship reflects a deeper "hyper-spin" correlation, which provides a new perspective for understanding the nature of particles and their interactions.** If supersymmetry theory is correct, it may be possible to discover these supersymmetric partner particles in high-energy

physics experiments, thereby verifying the existence of hyper-spin characteristics at the particle level.

The Role of Hyper-spin Characteristics in Cosmic Evolution

- **Star Formation and Evolution**
 - In the early stage of star formation, the rotation of matter affects the process of star formation. Hyper-spin may cause matter to form an accretion disk around the star, and the matter in the accretion disk gradually accumulates toward the center of the star, promoting the growth of the star.
 - In the late stage of stellar evolution, hyper-spin affects the explosion mode and final fate of the star. For example, when a massive hyper-spinning star collapses to form a black hole, it may produce a more intense gamma-ray burst, which is one of the most violent celestial explosion phenomena in the universe.
- **Galaxy Structure and Dynamics**
 - Stars and gas in galaxies also have rotational motion. The hyper-spin characteristics of galaxies affect their morphology and structure. For example, the spiral arm structure of a spiral galaxy may be related to the rotation of the galaxy and the distribution of matter.
 - The hyper-spin of the supermassive black hole at the center of a galaxy has an impact on the dynamics of the entire galaxy. The rotation of the black hole drives the surrounding matter to form an accretion disk and generates strong jets. These jets can extend to tens of thousands of light-years or even farther, affecting the distribution and evolution of matter in the galaxy.

"Celestial hyper-spin" is not a standard term in the field of astronomy, but we can discuss its role in cosmic evolution from the perspective of the ultra-high-speed rotation of celestial bodies (close to the theoretical maximum rotation speed):

The Impact on the Structure and Morphology of Celestial Bodies Themselves

- **Shape Change:** A rapidly rotating celestial body changes its shape due to centrifugal force. Taking stars as an example, rapid rotation causes the star to bulge at the equator and become an oblate spheroid. This change in shape affects the distribution and movement of matter inside the star, and further affects the evolutionary process of the star. For instance, in the early stage of star formation, rapid rotation may cause matter to tend to accumulate in the equatorial plane, affecting the structure of the star's accretion disk and the matter accretion rate.
- **Internal Structure Stratification:** Hyper-spin triggers complex motion and convection patterns of matter inside celestial bodies. Inside planets, high-speed rotation makes the stratification of matter more obvious, and matter with different densities distributes in different layers under the combined action of centrifugal force and gravity. This stratified structure affects the heat conduction and energy transfer inside the planet, and plays an important role in the planet's geological activities and magnetic field.

The Impact on the Surrounding Environment

- **Matter Ejection and Accretion Disk Formation:** When a star or planet is in hyper-spin, the matter on its surface may be ejected because the centrifugal force exceeds the gravitational binding. The ejected matter forms an accretion disk around the celestial body. The accretion disk is an important structure in the process of star forming planets, matter exchange in binary star systems, and galaxy evolution. For example, in some young stellar systems, the hyper-spin of the star may eject a large amount of matter, which forms an accretion disk around it and may eventually evolve into celestial bodies such as planets.
- **Magnetic Field Enhancement:** The rotation of celestial bodies is one of the important factors for generating magnetic fields. Hyper-spin

enhances the dynamo effect inside the celestial body, thereby generating a stronger magnetic field. Taking the Earth as an example, the Earth's rotation generates the geomagnetic field, and if the Earth were in hyper-spin, the geomagnetic field would be significantly enhanced. A strong magnetic field can protect the surface of the celestial body from cosmic rays and solar wind, which is of great significance for the birth and evolution of life. On the scale of stars and galaxies, a strong magnetic field also affects the movement and distribution of interstellar matter, and has an impact on star formation and galaxy evolution.

The Impact on Galaxy Evolution

- **Galaxy Morphology Shaping:** The rotation of stars and gas in galaxies plays a key role in the morphology of galaxies. If the celestial bodies in a galaxy generally have hyper-spin characteristics, the morphology of the galaxy may change significantly. For example, in a spiral galaxy, the hyper-spin of stars may make the spiral arms of the galaxy more obvious and compact, affecting the matter distribution and dynamic structure of the galaxy.
- **Galaxy Merging and Interaction:** When two galaxies approach and merge with each other, the hyper-spin of celestial bodies in the galaxies affects the process and result of the merging. Hyper-spinning stars and gas clouds produce more complex dynamic interactions during the merging process, which may lead to the enhancement or weakening of star formation activities and the evolution of the galactic nucleus. For example, in some galaxy merging events, hyper-spinning stars may be ejected to the outer edge of the galaxy, forming stellar streams in the galactic halo.

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The Impact on Galaxy Evolution● **Galaxy Morphology Shaping:** The rotation of stars and gas in galaxies plays a key role in the morphology of galaxies. If the celestial bodies in a galaxy generally have hyper-spin characteristics, the morphology of the galaxy may change significantly. For example, in a spiral galaxy, the hyper-spin of stars may make the spiral arms of the galaxy more obvious and compact, affecting the matter distribution and dynamic structure of the galaxy.● **Galaxy Merging and Interaction:** When two galaxies approach and merge with each other, the hyper-spin of celestial bodies in the galaxies affects the process and result of the merging. Hyper-spinning stars and gas clouds produce more complex dynamic interactions during the merging process, which may lead to the enhancement or weakening of star formation activities and the evolution of the galactic nucleus. For example, in some galaxy merging events, hyper-spinning stars may be ejected to the outer edge of the galaxy, forming stellar streams in the galactic halo.● It connects micro-particles with the macro-universe, and the transience of life with the eternity of celestial bodies, constructing a cosmic view that is dynamic, interconnected and full of internal vitality. This goes beyond the simple dualism of "birth-destruction" and points to a more complex and in-depth natural philosophy.

We hope to sort out, respond to and extend the above content, and conduct an in-depth discussion:

Extraction and Resonance of Core Ideas

Judging from the discussion of the core content, the key points are as follows:

- 1. Integrity and Relevance:** The universe is not a simple mechanical collection, but an overall network where everything from elementary particles to galaxy clusters is interconnected and mutually influential. The state of particles is inseparable from the evolution of the universe.
- 2. Non-terminality of the Process:** "Destruction" or "death" is not the end of existence, but an intense link in the transformation of forms, and a part of a larger cycle and more complex evolutionary process. A moment of life is a flame of victory, and the explosion of a supernova is also a forging factory for new elements.
- 3. Limitations of Observation:** The cosmic phenomena observed by humans so far, no matter how magnificent or terrifying they are, are only "the tip of the iceberg" or "a drop in the ocean". We cannot easily deduce the ultimate fate of the entire universe from local phenomena.
- 4. Complexity of Levels:** The evolution of the universe has different levels. The destruction of a planet is a local event, the collision of a galaxy is a regional event, and the evolution of the spacetime structure of the entire universe is a global event. The laws they follow and the impacts they produce are different at

different scales.

Deepening and Discussion of Key Arguments

Based on the above arguments, we will make some extensions starting from some concepts of modern physics and cosmology:- Regarding "particle groups and the universe": This view is very cutting-edge. Modern physics holds that all things in the universe are indeed composed of elementary particles and their interactions. Quantum field theory believes that space itself is filled with various quantum fields, and particles are excitations of the fields. The so-called "annihilation" is actually the transfer and form transformation of energy between fields. Therefore, a "universe" without particles (or without quantum fields) is unimaginable. The evolution of the universe is essentially the evolutionary history of these fields.- Regarding "the universe does not simply move towards an end": This is consistent with the current mainstream cosmological picture. Even within the framework of the "heat death theory" (the universe will eventually reach maximum entropy and be in a state of lifelessness), this process is extremely long. During this process, local regions can form galaxies and stars due to gravity, thus "moving against entropy" and creating temporary order. In addition, hypotheses about dark energy and the final fate of the universe (such as Big Rip, Big Freeze, etc.) all show that the ending is not singular, and the process is full of variables.- Regarding "initial state, steady state, dynamic state, and final state": This is a very good framework.- Initial State: The current mainstream theory, the "Big Bang", describes that our observable universe had a dense and hot beginning, but it may just be a local event in a larger "multiverse".- Dynamic State: This is the stage we are currently experiencing - the universe is expanding at an accelerated rate, stars are born and die, galaxies merge, and black holes devour and eject matter. This is an extremely active "middle-aged" period.- Steady State: There seems to be no absolute "steady state" in the universe. However, on certain scales (such as the uniformity of the cosmic microwave background radiation) and in some theories (such as the "steady-state cosmology" which has basically been negated), people once pursued a constant picture.- Final State: As mentioned above, the final state is open and undetermined, and it is the frontier of scientific research.- Regarding "locality and globality": This is the most critical point in the discussion. The death of the Sun (it will become a red giant in about 5 billion years and swallow the inner planets) is a global disaster for the solar system, but it is just a local stellar evolution event for the Milky Way. The evaporation of a black hole (Hawking radiation) is an "end" for the black hole itself, but the energy and particles it releases become part of the cosmic background. Therefore, the so-called "destruction" always has a context and a scale.

Integration and Outlook: A Dynamic Hierarchical Cosmic View

Synthesizing your ideas, we can describe such a cosmic picture: The universe is a dynamic system that continuously undergoes the reorganization and transformation of energy, matter and information at multiple levels.- At the micro level: Quantum fluctuations, the generation and annihilation of particle pairs are the most basic manifestations of cosmic vitality.- At the macro level: These particles constitute the world we are familiar with, and the birth and death of life are the ultimate manifestations of the complexity of matter.- At the cosmic scale: Gravity dominates the fate of celestial bodies. The nuclear fusion of stars creates elements necessary for life. Supernova explosions

scatter these elements into interstellar space, providing raw materials for the formation of the next generation of stars and planetary systems. As a gravitational singularity, black holes affect the spacetime structure in an extreme way and may also be regulators of the evolution of some galaxies. In this picture, "destruction" is the most intense and conspicuous "phase transition" node in the reorganization process, not the end. These thoughts touch on the intersection of science and philosophy. Science uses empirical evidence and mathematical models to describe "how", while philosophy guides us to think about "why" and the "essence" behind it. It is correctly pointed out that the path of science is long, and more "detectors, telescopes and landing programs" are needed. Every new observation, such as the early galaxies seen by the James Webb Space Telescope, or the black hole merger captured by gravitational wave detectors, adds a new piece to our incomplete cosmic puzzle. In the end, we may never be able to know the ultimate answer to the "overall effect of the entire natural universe", but it is precisely this curiosity and exploration of "beyond the blind spot of vision" and the pursuit of the in-depth connection between "particle groups" and "superstars" that define the height of human wisdom and ignite the "flame of victory and beauty" in every moment of our lives.●● Every moment of life is not moving towards an end; every moment is igniting a flame of victory and beauty. Similarly, celestial bodies such as the Earth, the Moon, Mars, Jupiter, the Sun, the Milky Way, constellations, black holes, supergiants, and superstars are not simply and absolutely moving towards an end and destruction. The annihilation and disappearance of particles are closely related to the existence of celestial bodies and planets in the natural universe. Therefore, the existence, movement and variation of particles are inseparable from the life and death of the universe. Living species have their own birth, death, survival and continuation